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(54) **Electrical arc interruption chamber, in particular for fluid-quenched circuit breakers.**

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FR-A- 2 518 798
FR-A- 2 519 470
US-A- 4 289 942

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Description

The present invention relates to a fluid-quenched circuit breaker.

It is to be noted that FR-A-2 519 470 discloses a fluid quenched circuit breaker in which there are shown a movable arc contact of the "tulip" type, a bell-shaped element of electrically insulating material and two chambers for the passage of the arc quenching fluid.

US-A-4 289 942 and FR-A-2 518 978 substantially disclose circuit breakers similar to the above mentioned one.

The energy developed by the electrical arc, while heating the gas, decomposes it, generating a pressure which provides a blast of fluid onto the arc, causing it to be quenched.

According to known solutions, interruption chambers are equipped with elements of electrical insulating material, provided with suitably shaped and orientated openings, which allow the gas to circulate under pressure, to accomplish the quenching.

Such types of chambers, due to the difficulty of accomplishing the optimum conditions required for the interruption of the currents throughout the range provided by the operations, i.e., from the small overload up to the highest interruption powers, are characterized by a narrow operation range, i.e., if the dimensioning is designed to interrupt high currents, do not result effective in quenching the lower currents, and vice-versa.

Purpose of the present invention is to obviate the disadvantages of the cited prior art, by providing a universal interruption chamber, which, on the basis of its inner geometry, allows the necessary gas pressures and speeds, and hence high interruption powers to be generated without losing efficaciousness when the interruption of the lowest overload currents is required.

In order to achieve such a purpose, the present invention provides a fluid-quenched circuit breaker having the features claimed in claim 1.

The characteristics and the advantages of the present invention shall appear more clearly from the following disclosure, referred to the attached drawings, wherein:

Fig. 1 is a partially sectional exploded view of a first embodiment of a fluid quenched circuit breaker according to the invention,

Fig. 2 is a plan view of the intermediate element of Fig. 1,

Fig. 3 is a sectional elevation view of the elements of Fig. 1, in their assembled condition,

Fig. 4 is a sectional view along the path IV-IV of Fig. 3,

Fig. 5 is a sectional elevation view of a second embodiment of the interruption chamber accord-

ing to the invention, and

Fig. 6 is a sectional elevation view of a second form of practical embodiment of the interruption chamber according to the present invention.

Inside a tightly sealed electrical insulating encasing (not shown in the Figures; also other structural parts not strictly relating to the invention have, not been shown) containing an arc-quenching gas such as sulphur hexafluoride, there are provided current-bearing connections, respectively bearing a movable main contact 20 and a stationary main contact 20bis, together with the related arc contact 11 (the movable contact) and 11bis (the stationary contact).

Referring to the figures, there is shown a movable arc contact 11 of tubular type with longitudinal notches, or more precisely of the tulip type, positioned inside a bell-shaped element 12 of electrical insulating material, solid with the said movable contact, which surrounds it, and is positioned above the said arc contact 11.

The movable arc contact 11 and the inner surface 37 of the element 12 define a first chamber 13 comprised therebetween.

The movable arc contact 11 has an upper portion made of petals 14 radially enlarged upwards, and at the connection of which there are provided radial discharge holes 15.

An intermediate portion 16 radially enlarged to a ring-shape separates a lower threaded portion 17, suitable to be screwed within a complementary seat 18 centrally provided in a body 19 of a movable main contact 20.

Also from the bell-shaped element 12 a cylindrical threaded portion 21 protrudes downwards and it can be positioned within a complementary threaded seat 22, provided in the body 19 of the main movable contact 20 and externally concentric to the seat 18.

On its outer surface, the bell-shaped element 12 is provided with protruding portions 23, e.g., with four of them, running along generatrices thereof, bent towards a nozzle 24.

Coaxially arranged around said first chamber 13, a second chamber 25 is defined in its upper portion on one side by the element 12 and on the other side by a wall of electrical insulating material 26 having a crown 27, in which there is provided a nozzle-shaped opening 28.

The lower portion of chamber 25 is defined by the inner walls 29 of the body 19 on one side and on the other side by a corresponding lower outer portion of the element 12. A set of four holes 30 is positioned on an annular portion 31 of the body 19, concentric to said threaded seats 18 and 22.

The wall of electrical insulating material 26 and the movable main contact 20 are connected to each other by respective annular, threaded and

complementary undercuts 32 and 33 coupled with each other, creating one single outer body.

During the opening of the main contacts 20 and 20bis, the electrical arc is generated between the arc contacts 11 and 11bis. By overheating the surrounding arc-quenching medium, the arc causes it to flow, under pressure, inside the coaxial chambers 13 and 25 and inside the movable arc contact 11.

In particular, inside the chamber 25 the gas flows upwards, passing into a zone 34 at lower speed and pressure, and into a zone 35, of smaller volume, at higher speed and pressure. In this way, in the area wherein the electrical arc is generated, a more uniform and effective gas blast action is obtained, which allows a reduction in the arc-quenching times and hence a lower and more uniform wear of the top portion of element 12.

Furthermore, the particular profile of the bell-shaped element 12, and in particular the protruding portions 23 allow the gas pressure to be varied in the compression step during the opening of the contacts. As a consequence there is a reduction in the volume of the pumped gas and an increase in capacity of interruption, with the diameters of the stationary arc contact and of the movable arc contact, and the diameters of components 24-27 and 28 being the same.

As to the chamber 13, the suitably shaped discharge holes 15 allow the generation of a depression in an upper zone 36 of the movable arc contact 11 wherein the arc is generated. Such a depression allows the removal of heat from the zone 36 wherein the arc is generated, increasing the interruption power in that the arc which is generated on contacts opening is cooled more rapidly.

In another embodiment of the interruption chamber of the invention and shown in Fig. 5, element 12 is internally and in its lowermost portion provided, with a recessed portion 38, which defines, together with the movable contact 11, a volume greater than that defined by the homologous straight portion 37 of Fig. 3.

A further embodiment of the interruption chamber, according to the present invention, is shown in Fig. 6, with a movable contact 111 shaped as to have in its interior a portion 140 made of electrical insulating material, which modifies the gas discharge from the zone 113 towards the direction 141. In a similar way as in Fig. 3, the movable arc contact 111 is housed inside a seat 118 centrally provided in a body 119 of a movable main contact 120.

Coaxially with and externally to the seat 118 a suitably dimensioned annular through-hole 121 is provided, which places the chamber 113 in communication towards the bottom 142 with the re-

maining of the electrical insulating encasing (not shown).

In such a way, the chamber 113 and chamber 142 act, for certain current values, as a function of the diameter of hole 121 and of the volumes of chambers 113 and 142, as a double chamber for receiving the overheated gas, which flows downwards under its self-generated pressure. When the gas flows through the annular hole 121, quenching of the arc by heat removal from the arc zone during the passage of the arc current is achieved, and subsequently the current is in the proximity of zero.

Claims

1. Fluid-quenched circuit breaker wherein, inside a tightly sealed electrical insulating encasing, containing an arc-quenching gas, there are provided current-bearing connections, respectively supporting a movable main contact (20) and a stationary main contact (20bis), each one of said main contacts being provided with its respective arc contact (11, 11bis), said movable arc contact (11) of the tulip type being positioned inside a bell-shaped element (12) of electrically insulating material, said movable arc contact (11) and said bell-shaped element (12) being solidly fixed to each other, and being housed inside the body (19) of the said movable main contact (20), wherein a first chamber (13) for the passage of the arc quenching gas is defined between said movable arc contact (11) and said bell-shaped element (12), and a second chamber (25) for the passage of the said arc-quenching gas is defined between said movable main contact (20) and said bell-shaped element (12), characterized in that said bell-shaped element (12) is provided, on its outer surface, with protruding portions (23) formed along the generatrices thereof, said protruding portions (23) being bent toward a nozzle (24) on its upper surface.
2. Fluid-quenched circuit breaker according to claim 1, characterized in that said movable arc contact (11) of the tulip type is provided with petals (14) having an enlarged upper portion.
3. Fluid-quenched circuit breaker according to claim 1, characterized in that the said movable arc contact (11) of the tulip type is provided with petals (14) bearing an enlarged upper portion, and with discharge holes (15) positioned at the basis of said petals (14).
4. Fluid-quenched circuit breaker according to claim 1 and 3, characterized in that the said

first chamber (13) defined between said movable arc contact (11) and said bell-shaped element (12) communicates with said discharge holes (15) provided at the basis of said petals (14) of said movable arc contact (11).

Revendications

1. Disjoncteur à extinction par fluide dans lequel, à l'intérieur d'un boîtier étanche, isolant de l'électricité, contenant un gaz d'extinction d'arc, sont prévues des connexions électriques, respectivement supportant un contact principal mobile (20) et un contact principal stationnaire (20bis), chacun desdits contacts principaux étant pourvu de son contact à arc respectif (11, 11bis), ledit contact à arc mobile (11), du type en tulipe, étant positionné à l'intérieur d'un élément en cloche (12) composé d'un matériau isolant de l'électricité, ledit contact à arc mobile (11) et ledit élément en cloche (12) étant fixés fermement l'un à l'autre et étant logés à l'intérieur du corps (19) dudit contact principal mobile (20), disjoncteur dans lequel une première chambre (13), servant au passage du gaz d'extinction d'arc, est définie entre ledit contact à arc mobile (11) et ledit élément en cloche (12), et une seconde chambre (25), servant au passage dudit gaz d'extinction d'arc, est définie entre ledit contact principal mobile (20) et ledit élément en cloche (12), caractérisé en ce que ledit élément en cloche (12) est pourvu, sur sa surface extérieure, de parties en saillie (23) formées sur ses génératrices, lesdites parties en saillie (23) étant pliées en direction d'un nez (24) situé sur sa surface supérieure.
2. Disjoncteur à extinction par fluide selon la revendication 1, caractérisé en ce que ledit contact à arc mobile (11) de type en tulipe est pourvu de pétales (14) présentant une partie supérieure agrandie.
3. Disjoncteur à extinction par fluide selon la revendication 1, caractérisé en ce que ledit contact à arc mobile (11) de type en tulipe est pourvu de pétales (14), comportant une partie supérieure agrandie, et de trous de décharge (15), positionnés à la base desdits pétales (14).
4. Disjoncteur à extinction par fluide selon la revendication 1, et 3, caractérisé en ce que ladite première chambre (13), définie entre ledit contact à arc mobile (11) et ledit élément en cloche (12), communique avec lesdits trous de décharge (15) prévus à la base desdits

pétales (14) dudit contact à arc mobile (11).

Patentansprüche

1. Mit einem strömenden Medium gelöschter Schalter, worin innerhalb eines ein Lichtbogenlöschgas enthaltenden und dicht abgeschlossenen elektrisch isolierenden Gehäuses stromführende Verbindungen vorgesehen sind, welche einen beweglichen Hauptkontakt (20) und einen ortsfesten Hauptkontakt (20bis) abstützen, wobei jeder der Hauptkontakte mit seinem zugehörigen Lichtbogenkontakt (11, 11bis) ausgestattet ist, der bewegliche Lichtbogenkontakt (11) vom Tulpentyp innerhalb eines glockenförmigen Elements (12) aus elektrisch isolierendem Material angeordnet ist, der bewegliche Lichtbogenkontakt (11) und das glockenförmige Element (12) miteinander fest verbunden und im Körper (19) des beweglichen Hauptkontakts (20) eingeschlossen sind, eine erste Kammer (13) für das Hindurchströmen von Lichtbogenlöschgas zwischen dem beweglichen Lichtbogenkontakt (11) und dem glockenförmigen Element (12) ausgebildet ist und eine zweite Kammer (25) für das Hindurchströmen von Lichtbogenlöschgas zwischen dem beweglichen Hauptkontakt (20) und dem glockenförmigen Element (12) ausgebildet ist, dadurch gekennzeichnet, daß das glockenförmige Element (12) an seiner Außenseite mit entlang der Erzeugenden dieses Elements geformten vorspringenden Teilen (23) versehen ist und die vorspringenden Teile (23) in Richtung zu einer Düse (24) an der Oberseite des Elements umbogen sind.
2. Mit einem strömenden Medium gelöschter Schalter nach Anspruch 1, dadurch gekennzeichnet, daß der bewegliche Lichtbogenkontakt (11) vom Tulpentyp mit Zungen (14) versehen ist, die einen verdickten Oberteil besitzen.
3. Mit einem strömenden Medium gelöschter Schalter nach Anspruch 1, dadurch gekennzeichnet, daß der bewegliche Lichtbogenkontakt (11) vom Tulpentyp mit einen verdickten Oberteil tragenden Zungen (14) und mit Ausströmlöchern (15) versehen ist, welche an der Basis der Zungen (14) vorgesehen sind.
4. Mit einem strömenden Medium gelöschter Schalter nach Anspruch 1, und 3, dadurch gekennzeichnet, daß die zwischen dem beweglichen Lichtbogenkontakt (11) und dem glockenförmigen Element (12) vorgesehene erste Kammer (13) mit den an der Basis der Zungen

(14) des beweglichen Lichtbogenkontakts (11) vorgesehenen Ausströmlöchern (15) in Verbindung steht.

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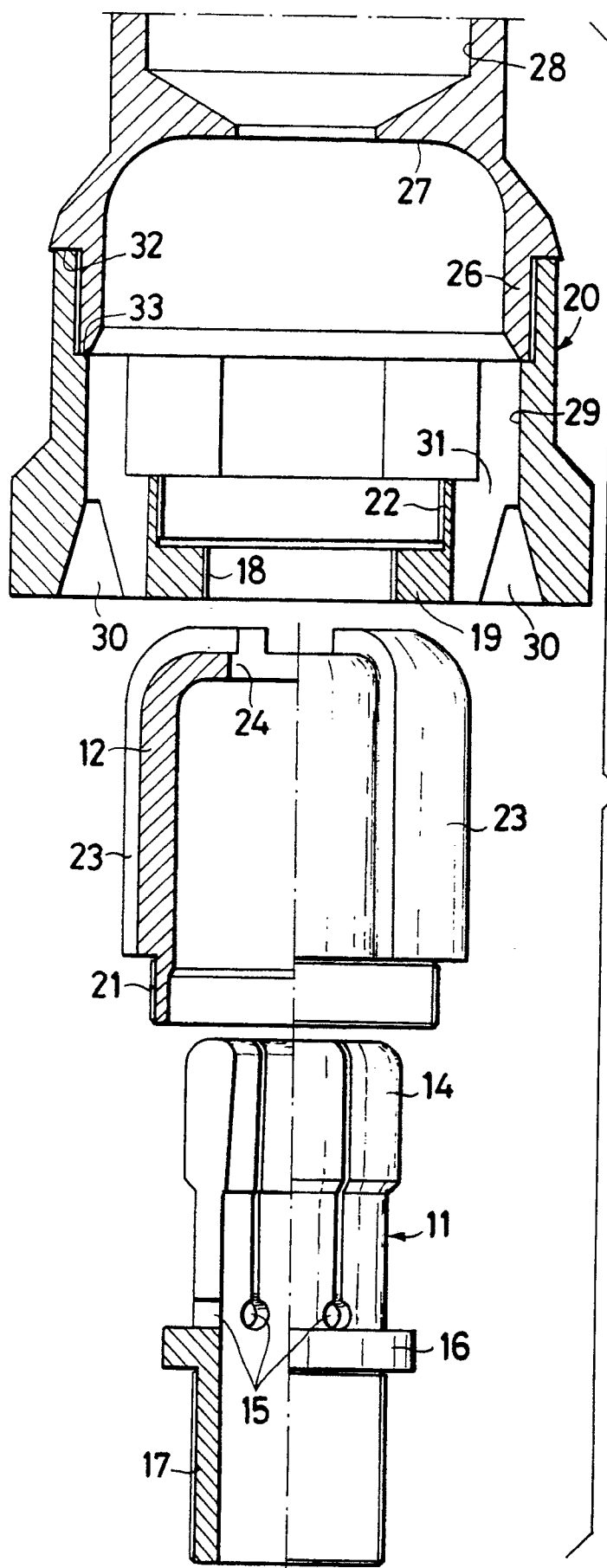


Fig.1

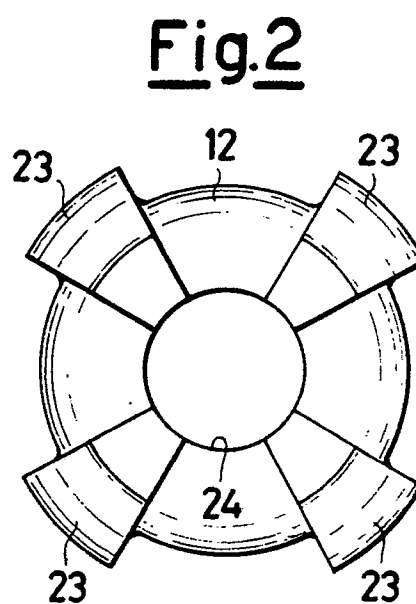
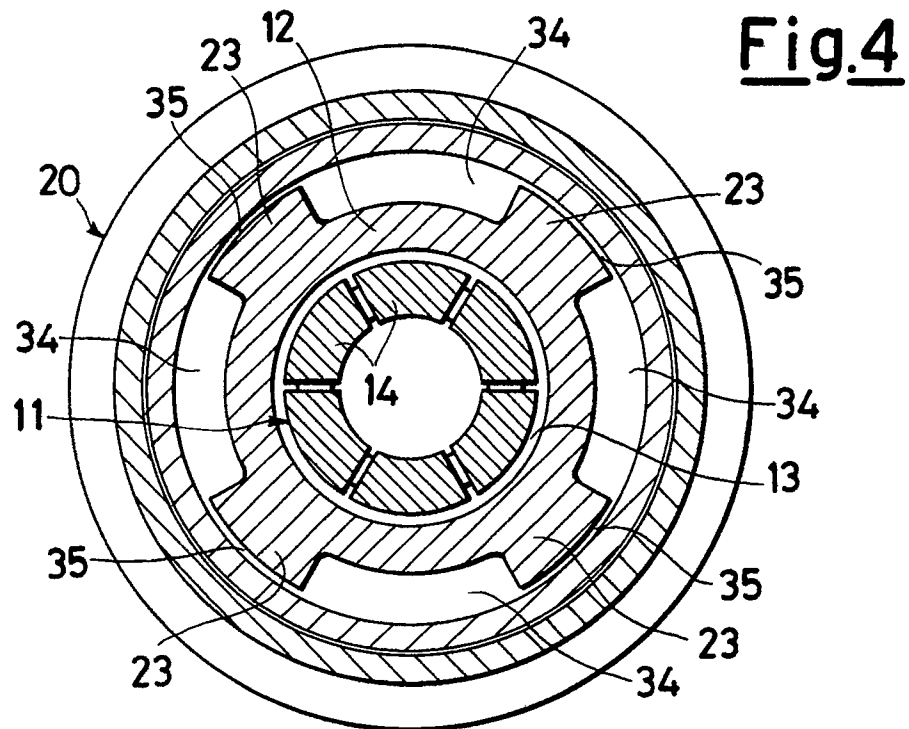
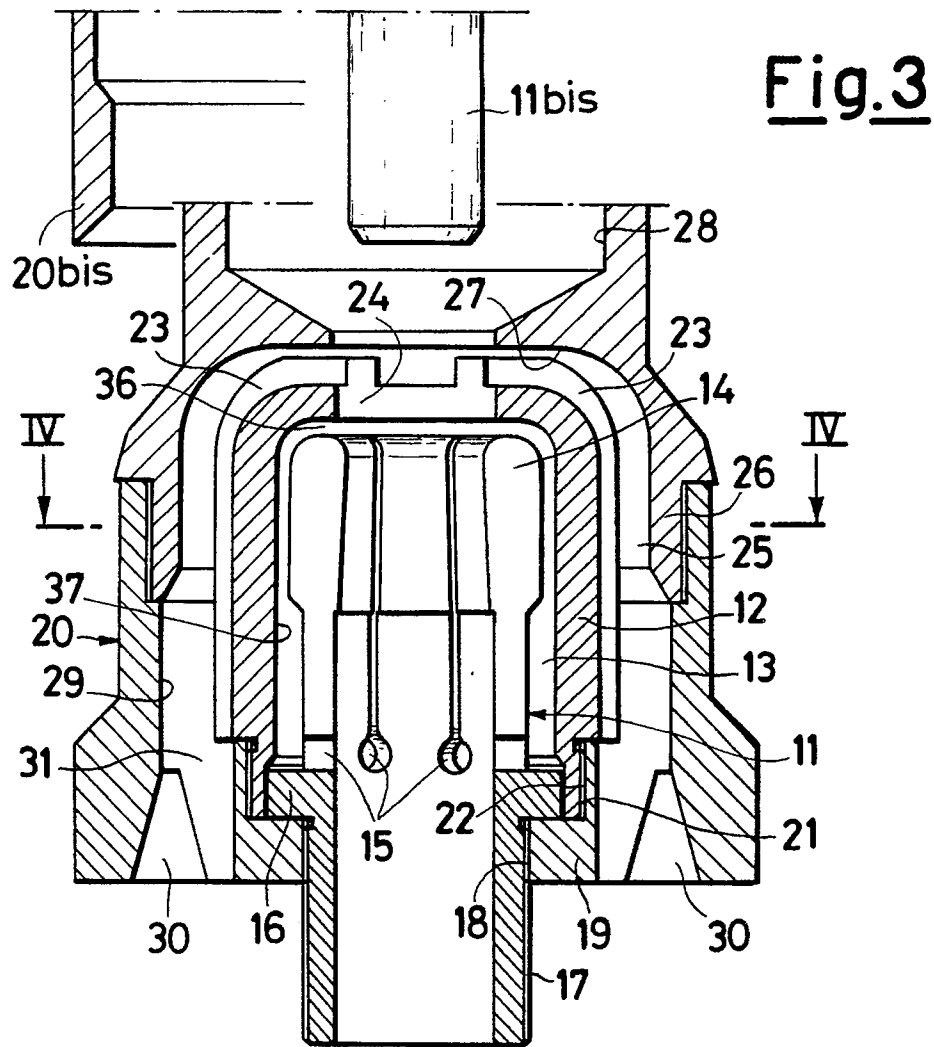


Fig.2



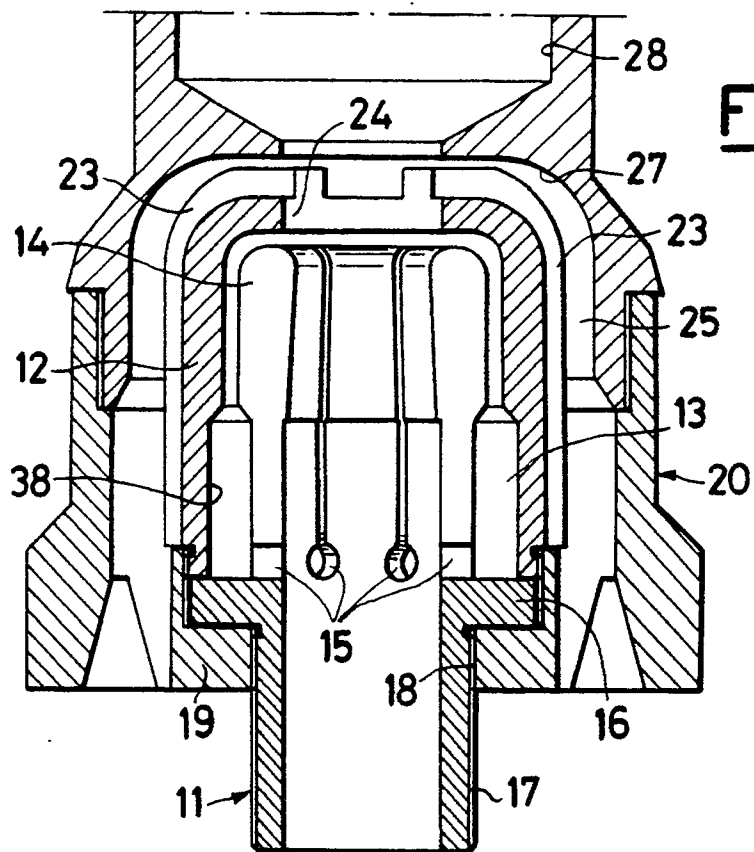


Fig.5

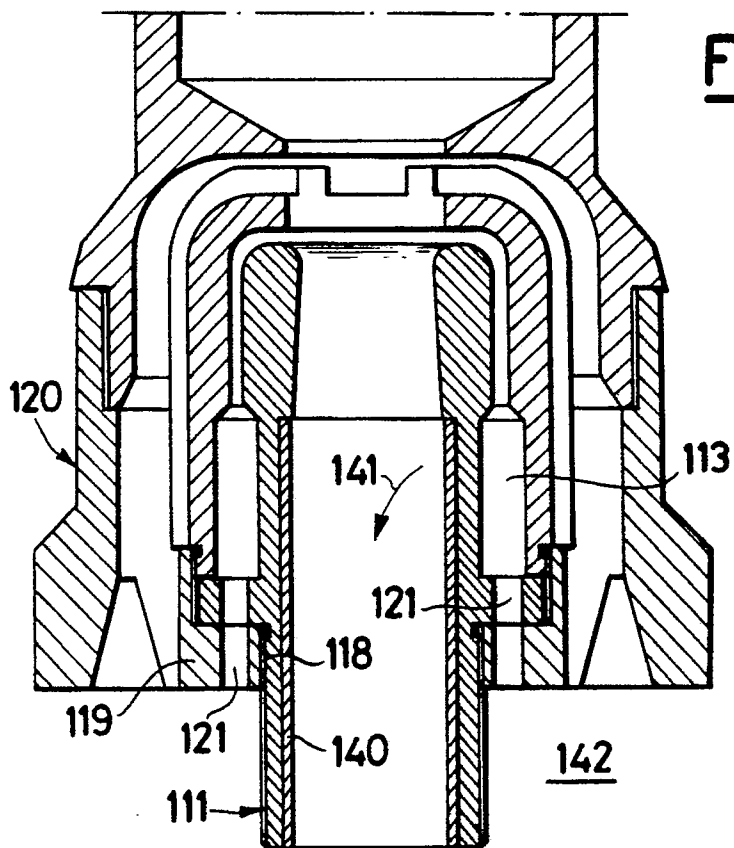


Fig.6